Preventative Maintenance System

The 'Preventative Maintenance System' (PMS) is a maintenance management system developed and followed by JCI Jones Chemical to maintain its current equipment and systems. PMS is a proactive approach to keeping our Plants running safely and efficiently, thereby reducing downtime. Proper maintenance can also extend the life of the mitigation systems and promote Plant safety. Based on the lessons learned during the past eight years, it is clear that a properly managed PMS program goes a long ways toward preventing costly repairs to critical equipment.

The 'Preventative Maintenance System' is designed to cover all the major components and associated parts of Branch equipment and systems. The person responsible for performing the PMS must document the work being performed utilizing the required forms. Equipment, systems or parts found out of the norm or requiring additional repair work should be noted on the PMS paperwork.

There are three parts to the Preventative Maintenance System (PMS). These parts include the Scheduling of Maintenance, the Performance of Maintenance and the Documentation of all work performed. These three parts are all equally important and mutually supporting to form a single comprehensive and effective program. A failure of any of these three parts will render your program ineffective and out of compliance with JCI policy.

A maintenance person must be aware of the potential hazardous associated with pressure and live lines when performing some of the required maintenance. It is also important to follow established Company guidelines pertaining to line breaking, confined space entry, hot work and lockout / tag-out procedures. It is also important to keep in mind that the following discussion is applicable to both compressed gases and liquid product systems.

A. Scheduling Maintenance

Preventative Maintenance checks are broken down into various time periods and or frequencies. The frequency of PM checks is based on manufacturer's recommendations, generally accepted good engineering practices and prior operating experience; i.e., some maintenance checks are required daily while others may be monthly, quarterly, or even annually.

Monthly, weekly and daily PM checks represent the bulk of our PMS Program. Monthly inspection criteria and the forms to be used to document the checks have been developed and are found in this manual. It is important to note that the Monthly PM Reporting paperwork must be customized to meet the needs of a specific Branch. Copies of PMS paperwork are due to the Safety Department by the 10th of each month while the original documentation is to be retained at the Branch.

Preventative Maintenance that is required quarterly, semi-annually, annually or less frequently is considered long term and should be set up on a 'Long Range PMS Program' The long range PM program is based on Branch specific equipment and must be customized to meet current

Branch needs. (A sample of the Long Range Plan is included at the end of this chapter.) Preventative Maintenance considered to be long term is to be scheduled in addition to the monthly, weekly and daily PM's assigned each month. The documentation for long term PM will be covered in the 'Equipment History' section of this manual.

B. Performing Maintenance

The objective of preventative maintenance is to ensure equipment is working both correctly as designed and safely. Maintenance is also designed to maximize the life of equipment and minimize the amount of unscheduled downtime due to breakdowns. Preventative Maintenance can be broken down into three different categories: Inspections, Function Tests or General Service. All three functions make up the PMS Program.

1. Inspections: Inspections can be as simple as looking at a piece of equipment for obvious signs of a problem or as complicated as disassembling something for a more in-depth examination. Inspections can reveal potential problems which may require immediate attention, thereby preventing the complete failure of a piece of equipment. Knowing about a potential problem, in advance, will also allow the purchase of repair parts in a timely manner as opposed to under emergency conditions.

2. Function Tests: Function Tests are used to verify the equipment is working the way it is designed to. The function test is used to simulate the parameters that the equipment or system is designed to work within and to ensure that the equipment operates as it is designed. Any equipment or system found not functioning correctly will require further investigation. Ideally, the equipment can simply be serviced or repaired and put back into immediate service.

3. General Service: General Service encompasses a broad spectrum of options. This could include but is not limited to: lubrication, calibration, cleaning, adjusting or simply cycling a piece of equipment. Most equipment manufacturers list preventative maintenance measures designed to keep the equipment in proper working order. The JCI - PMS program covers the most common preventative maintenance measures. Specific maintenance requirements unique to your Plant's equipment must be researched, added to this program and implemented. Reviewing the operator's manual for the equipment that you are using will provide any additional required information. If this information is not available then it must be acquired. It is very important that the Branch retain an owner's (operator's) manual for each and every piece of equipment that it uses. This manual will normally cover both the operational (PSM – Process Safety Information) and maintenance (PSM – Mechanical Integrity) information. Based on past experience, it is clear that proper and regular preventable maintenance service will extend the life of your equipment.

C. Preventative Maintenance - SOP

This section describes the procedures for performing preventative maintenance based on manufacturer's recommendations, generally recognized engineering principles and or years of experience. This section will cover the procedures for conducting the inspections, function tests and general service requirements of all JCI systems and equipment. This program is written

using both terminology and verbiage that is unique to JCI Plant operations. A basic understanding of the Plant equipment and systems is essential to properly performing the required maintenance.

1. Actuated Valves:

Actuated valves at a JCI Plant can be divided into three categories: Fail Safe Valves, Control Valves, and Modulation Valves. The majority of Fail Safe valves utilized at JCI are designed to 'air open / spring close' and are commonly found in our mitigation systems. Control valves are designed to 'air open / air close' and can normally be found in areas of the Branch where a hand operated valve is not practical such as a process valve located in the ceiling. Modulation valves are normally found on a bleach machine and are used to control the flow of raw materials. Preventative maintenance on all three types of valves is basically the same and must be performed as described below:

- ✓ Cycling – Cycle the valve to ensure that it is working correctly. This can be accomplished by turning the valve on and off to ensure that the valve is operating properly. Fail Safe Valves will require an additional test to ensure proper operation. This will involve the removal or securing of an air source. If the valve is operating correctly, the valve should completely close once the air supply is removed. Modulation valves can be tested by putting the valve in manual and opening and closing the valve at the controllers on a bleach machine. Any valve that does not operate correctly should be repaired or replaced.
- ✓ Filter – If equipped with an air filter, check the filter cup and make sure it is free of any scale or grit from the air system. (Excessive scale and grit is an indication of an airline problem and should be investigated.)
- ✓ Lubrication – The actuator needs to be lubricated. Ensure you lubricate the inside of the actuator with #1 grease; actuator only.
- ✓ Adapter - Check the alignment of the actuator's adapter while the valve is being cycled. Adjust or replace adapters that do not close the valve off completely. Ensure all mounting bolts on the actuator are in place and tight. Carbon Steel adapters wear out over time and can be replaced with Stainless Steel ones.
- ✓ Packing – Tighten the valve packing as necessary to prevent any leakage.
- ✓ Body Bolts – If the valve has body bolts (two piece valves), ensure the bolts are all intact and tight.
- ✓ Solenoid – Make sure all electrical connections on the solenoid are tight. Any solenoids that rattle, hum or leak air should be disassembled, inspected, repaired, and or replaced if necessary.
- ✓ Hoses / Tubing and Air Connectors - Inspect hoses or tubing for cracks, flat spots or leaks. Ensure all air connection devices are working correctly. Replace as necessary.
- ✓ Indicator – If the valve is equipped with a position indicator, ensure that the indicator is tight and in the correct position.

2. Manual Valves:
Manual valves are used in both 'Process Control' and 'Service' applications. It is relatively easy to detect a problem with a valve used in a process control application as these valves are normally cycled many times in a given month if not in a given day. (Example: chlorine 'fill' station.) Manual valves used in service applications however, may be cycled considerable fewer times unless there is a reason to use it. (Example: valve on an expansion chamber; unless the rupture disc is blown, there is no reason to turn the valve off.) Regardless of the application, the following maintenance must be performed:

- ✓ Cycling – Cycle the valve to ensure that it is working correctly. This can be accomplished by opening and closing the valve. If the valve will not operate correctly, then it should be repaired or replaced.
- ✓ Handles – Inspect the valve handle to ensure that it fits properly, and that the handle is tight and will completely open or close the valve. (This is a particular problem with small, ½" and ¾" chlorine valves.) Any handle that has 'hour glassed' or does not completely close the valve should be replaced. As a note: The over-tightening of a plastic valve can lead to handles being 'snapped' off.
- ✓ Packing – Tighten the valve packing as necessary to prevent any leakage.
- ✓ Body Bolts – If the valve has body bolts (two piece valves), make sure the bolts are intact and tight.

3. Compressed Gas Transfer Hoses and Whips
Compressed Gas Transfer Hoses and Whips are used to transfer CL2 and or SO2 in both liquid and gaseous forms. (Transfer Hoses on railcars, Whips at fill stations.) Monthly maintenance consists of visual inspections. If the visual inspection yields a problem with the transfer hose or whip, it must be replaced, as it cannot be repaired. The following maintenance inspections must be performed:

- ✓ External Inspection – The transfer hose or whip must be externally inspected for any signs of degradation or distortion. The hose or whip should be free of kinks, bulges and or flat spots. The protective jacket must not be separated from the fitting ends. If the whip has a kink, flat spot or the protective jacket is found to be loose or torn, it should be thoroughly inspected for possible replacement.
- ✓ Valve Adapter – Inspect the 'valve adapter' on the whip. If the valve adapter is bent or worn out, it must be replaced.
- ✓ Railcars Nipples – Inspect the nipples (railcar pipes) going into the railcar. The nipples should not be worn out from excessive force from a pipe wrench. The nipples should not be bent. The nipple threads should not be excessively worn such that the nipple can be screwed completely into the railcar angle valves. Two to three threads should be showing when properly installed into the angle valve. Replace nipples if necessary.
- ✓ Moisture – Transfer hoses, whips, and railcar nipples should be free of obvious moisture. If excessive moisture is found, further investigation is needed.

- ✓ Flanges – Inspect railcar hookup (ammonia) flanges for wear. Replace any flanges that are worn out and do not properly seal. Additionally, replace any bolts, washers or nuts that show any sign of corrosion or wear. Apply light grease to the bolts (bolts only). Stainless steel bolts will last much longer than the carbon steel bolts that come with the flanges provided by the supplier. Flange (railcar) gaskets should be replaced before each and every connection.
- ✓ Hammer Unions – If 'hammer unions' are used for railcar hookups, make certain they are dry and that the 'ears' are intact and not excessively distorted or worn. Hammer union O-Rings should be replaced before each connection. Ensure the proper O-Ring is being used as they are product specific.
- ✓ End Caps – End Caps used to cap off Transfer Hoses must fit tight and must be free of excessive moisture and or corrosion. Replace end caps as necessary.

4. Gauges

There are two types of gauges used in a typical JCI plant; temperature and pressure. It is important that the gauges work and work correctly. Due to the fact that Branches do not have a calibration department, all gauges requiring recalibration will be sent off site for calibration. For obvious reasons, it may be cheaper in some cases to replace a gauge than it is to have it recalibrated. The following maintenance inspections must be performed:

- ✓ External Inspection – Inspect the gauge for structural integrity. Ensure that the back of the gauge is not broken and that the glass on the gauge is intact. Gauges that show obvious physical damage should be repaired or replaced.
- ✓ Calibration Date – Gauges should be in calibration.
- ✓ Diaphragms – If a gauge is equipped with diaphragm, the diaphragm should be inspected for signs of excessive corrosion or signs that the diaphragm is leaking. Leaking diaphragms should be immediately replaced.
- ✓ Function Inspection – If a gauge has an obvious calibration problem, it should be re-calibrated or replaced.

5. Piping

Piping is the primary means by which product is transferred throughout the Branch. It is important that piping systems be properly inspected on a monthly basis. The following inspections must be performed:

- ✓ External Inspection – Piping systems should be inspected throughout the month for product leaks. Any leaks found regardless of product must be repaired.
- ✓ Piping Supports – Piping supports to include: Unistrut, piping bridges, fill station stands, and etc. must be inspected to ensure that the piping is properly supported, secured and safe.
- ✓ Blow / Vacuum Tons – Should be inspected for corrosion and or signs of leakage. They should all be kept clean and free of dust. Ton support racks should also be inspected for structural problems.

- ✓ Clean – All tons and steel piping should be kept clean and painted to prevent corrosion. These lines should also be properly labeled and or stenciled.

6. Electric Motors

There are many electrical motors in a Branch. Properly serviced motors will save the Company in both energy costs and costly downtime periods due to motor failure. The following maintenance must be performed:

- ✓ External Inspection – Externally inspect motors for proper mounting and operation. A motor should be secured to the base plate of the equipment it is running. There should not be excessive vibration from the motor nor movement of its base. (Always install mounting bolts with lock washers to prevent bolts from becoming loose.).
- ✓ Ventilation - The motors used at the Branches are typically 'Totally Enclosed Fan Cooled' (TEFC) motors. Cooling is provided from the fan blade turning on the end of the motor. Ensure that the fan guard on a motor is secure, clean and unobstructed so that air can be freely circulated across the motor.
- ✓ Greased – Depending on the type of motor, greasing or oiling the motor may be necessary. Service in accordance with manufacturer's specifications.
- ✓ Electrical Connections – Inspect all electrical connections. Ensure all electrical connections are tight. Make sure the motor has an electrical cover on its connection box to keep out fugitive fumes. Ensure electrical conduit is in place and tight. Repair or replace any broken conduit flex couplings.
- ✓ Excessive Heat or Knocking – If a motor has excessive heat or is 'knocking', an Amp Check should be performed. Motors should not draw more than their rated amp capacity during normal operation. Amp checks should be done with an amp meter. Excessive amp draw is an indication of either an electrical or mechanical problem and will require further investigation.
- ✓ Clean – Ensure the motor is kept clean and painted.

7. Pumps

The Branches use various types of pumps for specific functions and from various pump manufacturers. The specific maintenance requirements for each and every pump used throughout the Company are too broad to be discussed in this document, however, the following maintenance checks are generic to all pump types and manufacturers. Additional maintenance, if required by the manufacturer, should be set up on a pump-by-pump basis if necessary. The following maintenance must be performed on all pumps:

- ✓ External Inspection – Pumps should be externally inspected for corrosion, seals, leaks and coupling alignment. Parts with excessive corrosion should be replaced. Leaking seals must be replaced. Pump or connection leaks should be promptly repaired. Re-align all misaligned couplings. Air pumps used in filtration applications should also be inspected for excessive wear caused by abrasive filter powders. Note: Closely inspect the pump base to ensure it shows no signs of unacceptable deterioration.

- ✓ Vibration – Inspect the pump for excessive vibration or knocking. Retighten or shim a pump that has excessive vibration. (Pumps should always be secured to a pump base with bolts and lock washers to ensure the bolts do not loosen.) Internal knocking may be the result of bad bearings and may require the disassembly of the pump to properly investigate the problem. Do not continue to operate a pump with an internal knocking sound. It could lead to further damage to the impeller or pump shaft.
- ✓ Grease / Oil – The pump should be greased and or bearing oil should be added in accordance with the manufacturer's recommendations.
- ✓ Pump Seals – Mechanical Seals should not leak. Most JCI chemical pumps have mechanical seals. Inspect seals for leakage and repair or replace any seal that is leaking. Pump seals installed with 'Air Pad - Seal Flush Tanks' should be drained and refilled with fresh water. (This will keep salt and scale away from the pump seal.) Repair any air or water leaks on the seal flush tanks. Seal flush tanks need to be air padded to work correctly. Ensure that once refilled with fresh water, the seal flush tank has the appropriate air pad applied. Note: Seal flush tanks should be inspected daily to ensure the proper air pressure is being maintained. (Seal flush tanks at Branches located in cold weather climates are sometimes filled with a mixture of water and antifreeze. Ensure the antifreeze used is environmentally safe.) Packed pumps that are designed to drip should not exceed the manufacturer's recommendations regarding drips per hour. Tighten or replace packing as necessary to obtain desired drippage.
- ✓ Pump Couplings – JCI uses various flex couplings to connect the motor to the pump. These couplings are rubber or plastic and flexible in nature. The coupling assembly and flex coupling itself need to be examined for wear or damage. Damaged coupling assemblies or damaged flex couplings are a sign of pump misalignment and further investigation is needed. All couplings should be tight and secure.
- ✓ Pump Guards – If the pump requires a coupling guard or came equipped with a pump guard, the guard must be in place and secured. The guard must cover the moving parts of the entire coupling. Replace all missing or damaged guards.
- ✓ Clean – All pumps should be clean and free from product and dust. Metal pumps must be kept rust free and painted.

8. Tanks

There are many tanks that store liquid products at a Branch. In some cases, tanks are also used to manufacture products and are commonly referred to as vats. For the purpose of this discussion vats and tanks are considered to be one and the same. Tanks are to be thoroughly inspected to prevent catastrophic failure. The following maintenance inspections must be performed:

- ✓ External Inspection – Tanks should be externally inspected for stress cracks, 'spider web cracking' (common in both poly and FRP tanks), pitting (common in steel tanks), deformities (common in poly tanks), corrosion (common in steel tanks) and signs of leakage. Detected structural problems in the tank could be grounds for taking the tank out of service until repairs are made or the tank is replaced. Note: The 'Daily Inspection for Spills, Leaks, and Releases' should go a long way toward helping identify and minimize any potential problems with respect to tank integrity.

- ✓ Bolts Tight – Check the flange bolts or bulkhead fittings to ensure they are tight. (Do not over tighten bolts or bulkhead fittings.) Replace bolts or gaskets as necessary. Inspect the bulkhead fitting area on the tank for signs of stress cracks and particularly in the bolt-hole area.
- ✓ Expansion Joints – Many tanks have expansion joints attached to the tank. Inspect the expansion joint to make sure it does not leak or exceeds the preset limits on the joint itself. If the preset limits have been exceeded, replace the expansion joint.
- ✓ Clean – The exterior of the tank must be thoroughly cleaned each month. All tank stencils must be visible and readable.

9. Expansion Chambers

The expansion chamber is a system safety device designed to relieve excess pressure on a compressed gas system without the releasing of product. There are expansion chambers in both the chlorine and the sulfur dioxide systems. The following maintenance inspections must be performed:

- ✓ External Inspection – Inspect the expansion chamber for signs of corrosion or pitting. If pitting or excessive corrosion is found, the chamber should be replaced. Examine the chamber's mounting brackets; the chamber should be properly supported to prevent movement. Re-secure or tighten brackets if they are found loose.
- ✓ Rupture Disc – The rupture disc is designed to rupture if excessive system pressure is built up. If the expansion chamber gauge shows any pressure, it has ruptured. Once the disc has ruptured, it must be replaced.
- ✓ Valve – The expansion chamber system has a manual service valve designed to isolate the chamber so that the expansion chamber system can be serviced. Cycle the valve, inspect the handle and inspect the packing. Repair or replace if necessary.
- ✓ Gauge – Inspect the gauge. The gauge is the only way to tell if the rupture disc has been blown. It is imperative that the gauge works and is in calibration. Repair or replace the gauge as necessary.

10. Vacuum Alarm System

The vacuum alarm system is designed to alert an operator that there is little or no vacuum available. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect the vacuum ton for leaks, excessive corrosion or pitting. Tons that exhibit the aforementioned problems should be replaced.
- ✓ Internal Inspection – If equipped with an internal inspection plug, pull the plug and internally inspect the vacuum ton for excessive moisture and sludge build up. The vacuum ton should never have any liquid in it. Clean or replace ton as necessary.
- ✓ Valves – Follow actuated and manual valve preventative maintenance measures as discussed above.
- ✓ Lubrication – The actuated valve must be lubricated. Lubricate the actuator.
- ✓ Tubing – Inspect all tubing for cracks, kinks or blockage. Clean or replace as necessary.

- ✓ Pressure Switch – Inspect and ensure that the pressure switch's electrical connections are tight, that there are no exposed wires, and that there are no signs of corrosion.
- ✓ System Test - Remove all vacuum from the 'vacuum system' activating the pressure switch to ensure the Vacuum Alarm System works correctly to include audible and or visual alarms.

11. Vat Control System

The Vat Control System is designed to warn and or shut down the bleach and sodium bisulfite manufacturing processes if pre-set temperatures or product concentrations are exceeded. The following maintenance checks should be performed:

- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.
- ✓ Valves – Follow actuated and manual valve preventative maintenance measures.
- ✓ Lubrication – The actuated valve must be lubricated. Lubricate the valve actuator.
- ✓ Tubing – Inspect all tubing for cracks, kinks or blockage. Clean or replace as necessary.

12. Gas Detection System

The Gas Detection System is designed to detect fugitive emissions, activate alarms and shut down all compressed gas systems supplying the Plant. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect the gas detection probes to ensure that they are properly mounted and free of fugitive fumes from another source that may affect the detection process. (i.e., Paint). Re-mount or replace any probe which is either broken or not properly mounted. Where appropriate and if feasible, place a protective covering over the top of the probe and on both sides so as to protect it from the elements.
- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.
- ✓ Quad Scans – Ensure the Quad Scans and all associated electrical boxes are kept clean and secured to prevent fugitive fumes from reaching the electronics. Ensure that all channels, warning and shutdown lights on the quad scan all work correctly. Repair as necessary.
- ✓ Alarms – Ensure visual warning lights (Yellow and Red) and audio alarms function correctly at both parameters; i.e., warning and shutdown. Repair and or replace as necessary.
- ✓ Zero Probes – Zero all probes on a monthly basis. Running a magnet across the "zero" box on the probe itself completes zeroing. Any probe that fails to zero must be recalibrated or replaced.
- ✓ System Check – Activate the Gas Detection System with calibration gas or another approved activation gas. Ensure all actuated valves close and that both the visual and audible alarms sound when required to do so.

13. Railcar Valve Closure System

The Railcar Valve Closure System works in conjunction with the Gas Detection System to detect fugitive emissions, activate alarms, and shut down all compressed gas systems supplying the Plant to include all railcar angle valves. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect system for leaks, unsupported piping and or equipment mounting problems. Clean all dust off system. Check overall appearance of the entire system and ensure it is rust free and painted.
- ✓ Actuated Valves – Follow actuated valve preventative maintenance measures.
- ✓ Manual Valves – Follow manual valve preventative maintenance measures.
- ✓ Gauges – Follow gauge preventative maintenance measures.
- ✓ Tubing – Inspect all tubing for cracks, kinks and tight connections. Replace unserviceable tubing if necessary.
- ✓ Piping – Follow piping preventative maintenance measures.
- ✓ Air Receiver – Follow air receiver preventative maintenance measures.
- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.
- ✓ Air Filter – Check air filter and ensure filter is clean and free from excess moisture, rust or other foreign matter.
- ✓ Control Box – Ensure the electrical control box is kept clean and secured. Ensure all switches and lights are working correctly.
- ✓ Rotometer – Ensure rotometer is clean and the ball moves when air is applied.
- ✓ Pressure Switch – Ensure pressure switch is mounted and shows no signs of corrosion. Check electrical connection to ensure the connection is tight and free of fugitive fumes.
- ✓ Alarms –Ensure visual warning light and audio alarm function correctly and work.
- ✓ System Check – Given its purpose and capabilities, the Railcar Valve Closure System must be function tested in (4) ways: 1. Loss of Air (Below 90 PSI), 2. Loss of Power, 3. Gas Detection, and 4. Panic Buttons. In all cases, ensure all actuated valves close and that both the visual and audible alarms sound when required to do so.
- ✓ Air Hoses – Check air hoses for leaks, cuts, abrasions or distortions. Check hookup fittings to ensure they function correctly. Replace as necessary.
- ✓ Air Motors – The air motor valve closers are maintenance free, however the air motors themselves should be examined to ensure they are rust free and function correctly.
- ✓ Torque Limiting Adapters – The torque limiting adapters should be examined to ensure they are not damaged. Whether low torque or high torque, the limiting adapters will not function properly if damaged, bent or deformed in any way. Replace damaged units as necessary.

14. Tank Level Monitoring System

The tank level monitoring system is designed to alert an operator when a tank has reached selected pre-set high and low levels. The following maintenance check should be performed:

- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.

- ✓ Check each alarm during the month to ensure both High and Low Level Alarms are working.

15. Scale Shutdown System

The scale shutdown system is designed to shut off the flow of compressed gas to a container once a pre-set weight is achieved. The following maintenance checks should be performed:

- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.
- ✓ Valves – Follow actuated and manual valve preventative maintenance measures.
- ✓ Check scale bases to ensure they are clean and free of debris that may interfere with scale flexors.
- ✓ System Check – Simulate weight check and ensure actuated valves close when required to do so.
- ✓ E–Stop – Inspect and test the Emergency E-Stop to ensure it functions correctly.

16. Air Filters

Air Systems at JCI Plants utilize two types of filters on its air system: coalescing and particulate filters. These filters are normally installed before and after the Plant air dryer. The 'pre-filter' (coalescing filter) is used to filter out any oil or moisture prior to air reaching the air dryer. The 'after-filter' (particulate filter) is used to filter out broken down desiccant, rust or dirt after the air dryer. Both filters are important in maintaining a clean and dry air supply. You will also find a coalescing filter on the bleach machine and some of the mitigation systems. The following maintenance inspections must be performed:

- ✓ External Inspections – Inspect the filter housing(s) for cracks, leaks or distortions. Repair or replace any housing that does not pass the external inspection. Inspect piping to / from the filter to ensure that the piping is properly supported. Re-support inadequately supported or unsecured piping.
- ✓ Gauges – Ensure gauges are working properly in accordance with gauge preventative maintenance measure.
- ✓ Valves – Follow manual and actuated valve preventative maintenance measures. (The pre-filter should have a timed actuated valve on it to open and then close to allow moisture to escape.)
- ✓ Filter – Filters should be changed when there is a 5 psi pressure difference above normal 'In' and 'Out' pressures. Change filters as needed. (Note: Every 2 psi on the gauge equals 1 % of the unit's horsepower. Thus, dirty filters will use additional HP resulting in increased energy costs and decreased efficiency.) Most air filters have red and green indicators on them. A 'red indicator' would obviously indicate action is needed. Change filters as necessary.

17. Air Receivers

Compressor air tanks are used as large reservoirs of surplus air. Some Plants have one tank per compressor while others have two tanks. The following maintenance must be performed:

- ✓ External Inspection – Inspect the tank to ensure it is secured to the ground to prevent the tank from tipping over. Examine the tank for leaks, cracks or corrosion. Air tanks are considered high-pressure vessels, thus structural damage to the tank is grounds for taking the tank out of service.
- ✓ Gauges – Follow gauge preventative maintenance measures.
- ✓ Valves – Follow manual and actuated valve preventative maintenance measures. (If equipped, ensure that a 'timed' actuated valve is installed on the bottom of the air tank and is working. The timed valve is designed to open and close, allowing moisture to escape.)
- ✓ Pressure Relief Valve – Actuate the pressure relief valve. Ensure that it releases air and that the relief valve will reset.
- ✓ Clean – Clean the outside of the tank(s). Keep unit free of dust and scale. Keep tanks painted.

18. Demister

The demister is designed to remove water and oil from the compressed air prior to going to the air dryer's pre-filter. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect the demister to ensure that it is stationary. Inspect the housing for external corrosion, leaks or pitting.
- ✓ Gauges – Follow gauge preventative maintenance measures.
- ✓ Valves – Follow manual and actuated valve preventative maintenance measures. (Ensure that a 'timed' actuated valve is installed on the bottom of the demister and that it is working. The timed valve is designed to open and close to allowing oil to escape. Additionally, ensure that there is a receptacle in place to catch the oil and water.)

19. Air Backflow Prevention System

The 'Air Backflow Prevention System' is designed to prevent compressed gases from getting back into the air compressor system. The following maintenance checks should be performed:

- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and covered to prevent exposure to fugitive fumes.
- ✓ Valves – Follow actuated and manual valve preventative maintenance measures.
- ✓ Gauges – Follow gauge preventative maintenance measures.
- ✓ Lubrication – The actuated valve must be lubricated. Lubricate the actuators.
- ✓ Tubing – Check all air tubing for signs of cracks, kinks or blockage. Repair and replace as necessary.

- ✓ Pressure Switch and Pressure Differential Switches - Inspect and ensure that all electrical connections are tight and free of corrosive fumes. Insure that all tubing connections are tight with no leaks.
- ✓ System Test – Activate system to ensure both audible and visual alarms are working as designed and that the proper valves close as the system is designed.

20. Air Horn

Many of the Branches utilize air horns as a Plant evacuation alarm. It is important that these alarms work when needed. The following maintenance must be performed:

- ✓ External Inspection – Inspect the horn to make sure it is properly mounted and in a location where it can best be heard by all affected employees. Properly remount any horn that is found to be loose. Ensure the activating mechanism, chain or valve, is intact and functioning properly.
- ✓ Function – Sound the alarm to ensure it works properly and is loud enough to be heard by all affected employees. Investigate and repair a horn that fails to sound.
- ✓ Regulator / Filter – If equipped, inspect the regulator / filter and ensure that the air horn does not exceed recommended air pressures. Empty the filter bowl of grit or moisture.

21. Cooling Tower

The cooling tower is used to cool water. The cold water is then used to cool product during the bleach and or bisulfite manufacturing processes. Efficient cooling towers can save a Branch production time and energy costs. The following maintenance must be performed:

- ✓ External Inspection – The cooling tower has to be externally inspected for the following; structural damage, leaks and improperly supported piping. Repair or replace any damaged components found in the cooling tower. The inside of the cooling tower also needs to be inspected for scale, corrosion and dirt. If abnormally high amounts of scale, corrosion or dirt exist, the cooling tower must be cleaned.
- ✓ Float Valve – The float valve must be tested to ensure that the valve opens when the level in the cooling tower falls and closes when the optimum water level is reached.
- ✓ Motor – Inspect the tower's fan motor per the manufacturer's guidelines. In addition, inspect any belts or fan blades to ensure they are tight. If equipped with a direct drive transmission, check the oil level and flex coupling.
- ✓ Bearing Oil – Inspect the fan bearings and add oil or grease as necessary.
- ✓ Balance Valves – If equipped, ensure returned cooling water is properly balanced. This can be achieved by the proper setting of the cooling tower's balance valves on the top of the tower. Unbalanced water can lead to the overflowing of the cooling tower and unnecessary energy costs.
- ✓ Supply Water - Most JCI Plants use cooling towers in a closed loop chill water application to include bleach machines. The chill water in a cooling tower re-circulates through a chill water tank or directly through the heat exchangers in the case of a bleach machine. It is imperative that the chill water being used for cooling has its pH tested and recorded weekly. The testing of water pH is the only way to test the heat exchanger for

internal leakage. **Internal leakage can have a grave effect on chiller units and or cooling towers.** If the water pH is found to be over 9.0 s.u. or below 6.0 s.u., further investigation must be conducted to include the disassembly of all heat exchanger(s) connected to the cooling tower if necessary.

- ✓ Water Distribution Basins – Check all water distribution basins both for signs of leaking and for foreign debris that inhibit proper water flow; clean as necessary.

22. Heat Exchangers

Heat exchangers are vital to keeping products cool during the manufacturing process. Improperly maintained heat exchangers can result in added production time requirements and increased energy costs. Therefore, it is imperative that a heat exchanger functions effectively and efficiently. The following maintenance inspections must be performed:

- ✓ External Inspection – Inspect the heat exchanger for leaks. All leaks, whether water or product must be repaired. (Do not over tighten heat exchangers; consult manufacturer's specs on torque requirements.)
- ✓ Temperature Gauges – Temperature gauges must be functional to ensure that the heat exchanger is working. Minimal temperature change across a heat exchanger can be an indication of inefficient cooling or the possible clogging of exchange plates. Replace any gauge that is not working properly.
- ✓ Pressure Gauges – A significant pressure increase across a heat exchanger is also an indication of blockage. Blockage can lead to additional production times and additional energy costs. If blockage is suspected, the heat exchanger must be disassembled and cleaned. Replace or repair bad pressure gauges.
- ✓ Mountings – Ensure the heat exchanger is properly mounted to the floor to prevent excessive vibration and or the unit from tipping over. Ensure all piping to and from the heat exchanger is properly secured with 'unistrut' or other comparable pipe holders.
- ✓ Supply Water- Most JCI Plants run heat exchangers off 'closed loop' chill water. The chill water comes to the heat exchanger from the chill water tank. It is imperative that the chill water being used for cooling has its pH tested and recorded weekly. It is recommended that a pH monitor and alarm be installed on the chill water supply tank. The testing of water pH is an effective way to test the heat exchanger for internal leakage. **Internal leakage can have a grave effect on chiller units and or cooling towers.** If the water pH is found to be over 9.0 s.u. or below 6.0 s.u., further investigation must be conducted to include the disassembly of the heat exchanger if necessary.

23. Sparge Tubes

Bleach and Sodium Bisulfite vats are equipped with 'sparge tubes' designed to deliver compressed gas to the bottom of a manufacturing vat. Sparge tubes are normally made with Kynar pipe for bleach and Kynar pipe or stainless steel pipe for sodium bisulfite. The following maintenance check should be performed, regardless of the type of pipe:

- ✓ External Inspection – Inspect sparge tubes for proper support. A sparge tube should have minimal movement above the liquid level in the manufacturing vat. Kynar pipe sparge

tubes should be closely examined for signs of cracking. Replace all sparge tubes that show signs of cracking.

- ✓ Throttle Valves – The throttle valve on a sparge tube is designed to control the volume of product entering a manufacturing vat. Follow normal manual valve preventative measures. Adjust product flow as necessary.

24. Scrubbers

Scrubbers are used to prevent fugitive fumes from escaping from tanks and vats, thus minimizing the possibility of exposing employees to those fumes and or of creating a corrosive atmosphere. The following maintenance must be performed:

- ✓ External Inspection – Inspect the scrubber for cracks, leaks or distortions. Repair any leaks or cracks that are found. Inspect piping to the scrubber and ensure that the piping is properly supported. Re-support inadequately supported or unsecured piping.
- ✓ Internal Inspection – Internally inspect the scrubber for salt buildup. If excessive salt is found, the scrubber must be flushed out with water.
- ✓ Pump – Follow the pump preventative maintenance measures.
- ✓ Fan Motor – Follow the motor preventative maintenance measures.
- ✓ Fan- Ensure all fan blades are properly secured, ensure the fan is balanced and check the fan drive belt or transmission for proper operation.
- ✓ Spray Nozzle – If the scrubber is equipped with a spray nozzle, ensure that the nozzle is properly supported and free of salt build up.
- ✓ Flow Meter – If equipped with a flow meter, ensure the flow meter is clean and free of salt buildup. The ball or float should move freely in the site tube.
- ✓ Operator Check – Check with operator to ensure scrubber medium is being changed on a regular basis.

25. Bleach Machine

The bleach machine is designed to manufacture bleach on a continuous basis. A bleach machine running on a continuous basis is vital to the Branch's ability to meet its production requirements. The following maintenance must be performed:

- ✓ External Inspection – Inspect the entire bleach machine frame for signs of excessive corrosion. The machine should be kept clean and dry, painted, and stenciled and or labeled. Inspect the machine for loose or unsecured piping. If problems are found, re-secure the piping. **The bleach machine must be kept clean and painted.** Clean the frame, piping and all other components as necessary.
- ✓ Control or Metering Equipment - Inspect mounted equipment and control boxes. Ensure the equipment is properly secured. Ensure the control boxes are airtight and have positive displaced air to repel fugitive fumes. Reseal boxes if they are not airtight.
- ✓ Electrical Connections – Inspect and ensure all electrical connections are tight and free from fugitive fumes. There should not be any exposed wiring. Tighten and protect connections as needed.

- ✓ Air Tubing – Inspect air tubing for signs of moisture, cracking, kinks or salt buildup. Repair or replace as necessary.
- ✓ Actuated Valves – Follow actuated valve preventative maintenance measures.
- ✓ Manual Valves - Follow manual valve preventative maintenance measures.
- ✓ Gauges – Follow gauge preventative measures.
- ✓ Electrical Motor – Follow electrical motor preventative maintenance measures.
- ✓ Pump – Follow pump preventative maintenance measures.
- ✓ Tank – Follow tank preventative maintenance measures.
- ✓ Heat Exchanger – Follow heat exchanger preventative maintenance measures.
- ✓ Piping – There should not be any drips or leaks from any of the piping. All drips or leaks must be repaired.
- ✓ Air Filter – Bleach machines should be equipped with an air filter and blow off valve. Inspect the filter for excessive buildup of rust or scale. Open the Blow-Off Valve and blow clear any foreign debris found in the air lines.
- ✓ Reactor – Visually inspect the chlorine reactor for signs of leaks or excessive corrosion.
- ✓ Alarms- Test all bleach machine alarms to ensure they all work correctly. This can easily be accomplished by having a trained operator manipulate the machine to simulate alarm conditions. Replace alarm light bulbs as needed.
- ✓ Air Regulators - Inspect air regulating equipment. Clean filter as necessary.

26. Bleach Filter (Cartridge and Bag)

The bleach filter is used to filter out particulates that may be present in manufactured bleach. Most Branches use a combination of both cartridge and bag filters. The basic preventative maintenance is the same for both units. The following maintenance inspections must be performed:

- ✓ External Inspections – Inspect the filter housing(s) for cracks, leaks or distortions. Repair or replace any housing that does not pass the external inspection. Inspect piping to the filters to ensure that the piping is properly supported. Re-support inadequately supported or unsecured piping.
- ✓ Internal Inspection – Inspect the inside of the filter housing for signs of cracking. Inspect cartridge and or filter bag housing(s). Repair or replace as necessary.
- ✓ Gauges – Ensure gauges are working properly in accordance with gauge preventative maintenance measure.
- ✓ Manual Valves – Follow manual valve preventative maintenance measures.
- ✓ Filter – Filters should be changed when there is a 5 psi pressure difference above normal 'In' and 'Out' pressures. Change filters as needed. (Note: Dirty filters slow down loading times.)

27. Bleach Filter – Powell

The Powell Bleach Filter is used to filter out particulates that may be present in manufactured bleach. The Powell Filter is a sophisticated filter system which uses a combination of chemicals, wood fibers and filtration powder to filter out unwanted particulate in finished bleach. The following maintenance inspections must be performed:

- ✓ External Inspection – Inspect entire unit for leaks, unsupported piping and or equipment mounting problems. Clean all dust off the unit.
- ✓ Tanks – Follow tank preventative maintenance measures.
- ✓ Manual Valves – Follow manual valve preventative maintenance measures.
- ✓ Pump – Follow pump preventative maintenance measures
- ✓ Motors – Follow motor preventative maintenance measures.
- ✓ Gauges – Follow gauge preventative maintenance measures.
- ✓ Barrel Gear Box – Inspect barrel seals and gear box. Lubricate as necessary. Repair or replace bad seals.
- ✓ Air Lines – Check air lines for signs of internal corrosion or moisture. Clean as necessary. Check the pressure regulator for proper operation.
- ✓ Electrical Connections – Ensure all electrical connections are secure and tight. No wires should be visible.
- ✓ Pressure Relief Valve – Inspect valve for proper operation or signs of leaking.

28. Filter Press

Branches equipped with the Powell Filter System will also have a filter press. The purpose of the filter press is to remove filter powder and sediment from the 'Mud Tank' water. The following maintenance check should be performed:

- ✓ External Inspection – Inspect the filter press for leaks, cracks or other distortions that will affect the proper operation. The outside of the filter press must be kept clean and free of mud water / bleach and excess filter powder.
- ✓ Internal Inspection – Inspect each filter plate for tears or distortions in the filter cloth or plate gaskets. (Depending on the model.) Replace as necessary.
- ✓ Hydraulics – Check the integrity of the hydraulic ram and associated parts. Pay close attentions to hydraulic hoses. There cannot be any hydraulic leaks.

29. Valve Machine

The valve machine is used to install valves into cylinders under a controlled torque condition. The valve machine is equipped with an amp meter. The amp meter has a direct correlation between amps and foot-pounds. Installing valves over the required amperage will result in the over tightening of valves and rounding of threads. Installing valves under the required amperage will result in the valves not being tight enough. The following maintenance must be performed:

- ✓ Motor - Follow the motor preventative maintenance measures.
- ✓ Electrical Connections – Ensure all electrical connections are tight and protected from fugitive fumes.
- ✓ External Inspection - Inspect the valve machine for loose bolts and or loose universal joints. Inspect the unit's hydraulics for leaks or pump problems. Inspect the cylinder holding mechanism to ensure it will hold a cylinder without allowing the cylinder to spin. Adjust or correct all discrepancies.

- ✓ Regulator / Filter – Inspect the regulator / filter and ensure that the air pressure recommended to operate the machine is not exceeded. Empty the filter bowl of grit or moisture.
- ✓ Lubrication – The cylinder locking mechanism must be lubricated. Install an airline 'lubricator' to ensure the cylinder locking mechanism stays lubricated. Ensure the lubricator has oil.
- ✓ Valve Chuck – Inspect the valve chuck for internal wear and specifically where the valve fits into the chuck. The valve should fit snug but not tight. It is very important to ensure that the fit is not too loose or it can damage the 'outlet threads' on a valve body. If the valve chuck is too loose, it must be repaired (Weld and Grind) or the chuck must be replaced.
- ✓ Clean – The overall appearance of the valve machine should include being painted and free of rust.

30. Bead Blasters (Includes Tumbler Blaster)

The purpose of the bead blaster is to assist in the cleaning of valves and valve parts. Due to the hazardous characteristic of the bead blast dust, it is imperative that the bead blast equipment work properly. The following maintenance must be performed:

- ✓ Electrical Connections – Inspect all electrical connections and ensure all connections are tight and covered. Ensure a 'static wrist cord' is available for operators to avoid static shock.
- ✓ External Inspection – Inspect the bead blast cabinet for leaks or obvious damage. Repair or reseal all bead blast leaks. Inspect gloves for rips or leaks.
- ✓ Moisture – Sample the bead blast beads and check for signs of moisture. If moisture is found, the air system needs to be further evaluated. Moisture causes 'bead-clumping' creating unnecessary waste outfall.
- ✓ Regulator / Filter – Inspect the air regulator. Ensure the air pressure does not exceed the cabinet's rated pressure. Inspect the air filter and dump any grit or water that has accumulated in the filter cup.
- ✓ Re-claimer – Check the re-claimer for leaks. Repair all leaks.
- ✓ Blast Nozzle - Ensure your bead blaster nozzle is the correct size and not worn out. Excessive wear on the nozzle orifice will reduce pressure and cause more glass beads to be used than necessary.
- ✓ Hoses – Check all hoses and ensure they are all intact and in proper working order.
- ✓ Cabinet Glass – If equipped with a glass window, the glass should be clean and free from excessive wear and scratches. Replace as necessary.
- ✓ Tumbler Basket - If equipped with a tumbler basket, ensure the tumbler basket is in good condition with no visible holes in the basket other than those designed to be in the basket. Ensure there is no buildup of excessive dust on the tumbler basket motor.
- ✓ Vacuum Cleaner - If equipped with a vacuum cleaner, ensure that the vacuum cleaner bag is free of dust leaks and properly secured.

31. Valve Tester

The Valve Tester is used to pressure test rebuilt cylinder and ton valves in the valve shop. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect the tester for: Proper mounting, worn parts, water leaks, nitrogen leaks and excessive corrosion. Check water box to ensure no leaks are present.
- ✓ Valves – The valve tester is normally designed with 'maintenance free' needle valves. Inspect valves to ensure they operate correctly and do not leak by. Replace any unserviceable valves that do not function properly.
- ✓ Air Ram – Inspect air rams to ensure smooth operation. The air rams should go up and down completely as required.
- ✓ Gauges – The valve tester works off nitrogen bottles and thus has a two stage gauge. Ensure both gauges are work correctly. Replace gauge or regulator as necessary.
- ✓ Nitrogen Bottle Holder – due to the fact that nitrogen is a high pressure cylinder, ensure the nitrogen bottle is secured in the upright position. (Via chain or bottle holding clamp).
- ✓ Function Test – Operate all components of the valve tester. Ensure it works as designed.

32. Material Handling Equipment

There are many different types of material handling equipment designed for moving ton containers or providing access to railcars. This may include ton carts, ton rollers, ton lifters, rotators, and ton hoists. All are designed to assist the operator in the performance of his duties. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect the handling equipment to ensure it operates safely and properly. Inspect air bags to ensure they are free of dry rot or air leaks. Repair or replace any equipment that does not operate as designed.
- ✓ Adjust – Adjust rollers, catwalks or ton carts as needed.
- ✓ Rotator – If equipped with a rotator ensure that it turns correctly.
- ✓ Valves – Follow manual valve preventative maintenance measures.
- ✓ Lubrication – Most mechanical handling equipment has to be lubricated. Oil or grease the equipment in accordance with manufacturer's recommendations.

33. Hoses

Hoses are used to transfer liquid products to and from bulk storage tanks. The following maintenance checks should be performed:

- ✓ External Inspection – Inspect hoses for obvious defects; i.e., splits, cuts, excessive wear, elongation, flat spots and or deformation of any type. Repair or replace unserviceable hoses.
- ✓ Fitting - Inspect fittings for distortion, cracks, excessive wear, or broken or missing locking clamps. Replace unserviceable fittings.
- ✓ Gasket - Inspect the female coupling for a serviceable gasket. Check the gasket for cracks and dry rotting. Replace gaskets as required.
- ✓

- ✓ Hose Clamps -.Inspect the hose clamp(s) and ensure the fitting is tightly attached to the hose. Replace any clamps that show signs of fatigue, distortion or excessive corrosion.

D. Documentation of Work

The JCI-PMS Program requires all preventative maintenance work performed to be documented. Maintenance documentation is very important for production planning and plays a critical role in accident / equipment failure investigations. Maintenance work performed can be recorded on either the monthly PMS Paperwork or on the specific piece of equipment /system's Work History File.

Monthly PM Paperwork - Monthly PM paperwork includes Monthly, Weekly, and Daily PM's. This paperwork can be completed any time during the month and then forwarded to the Corporate Safety Department by the 10th of the following month. Blank templates of the Monthly PM Paperwork are located in the Mechanical Integrity Program Manual.

Unless otherwise noted, there are (5) primary columns on the PMS paperwork blank forms. They are as follows: Location, Specific Function, Current Status, Corrective Action and Corrective Action Date.

Location – Each piece of equipment should have a name and number that easily identifies the equipment in your plant. This is typically Branch specific and is assigned by the Branch.

Specific Function – Each piece of equipment should have a specific function that easily identifies what the equipment does.

Current Status – This column is used to record the current status of the specific equipment being maintained. OK – use this code when the item has been: inspected, function tested and or general serviced and is found to work correctly and has met the minimum criteria for the PM to be considered completed. Bad – Use this code when the equipment does not meet the completed PM criteria. OOS (Out of Service) – This is used when a piece of equipment is out of service but will be repaired. NLU (No Longer Used) - This is used when a piece of equipment is out of service and will not be repaired. In the situation where something is no longer used and will not be repaired it should be recorded one time then be removed from your PM Paperwork.

Corrective Action – Spell out the corrective action needed to complete the PM. (Replace valve, recalibrate, rebuild pump seal, etc…etc)

Corrective Action Date – The corrective action date is only used when the corrective action has been completed. The corrective action date is to be used to identify items that need to be added to the equipment history files. If no corrective action date is indicated, it will be assumed that action is still pending to resolve the issue.

Equipment History Files – Equipment History Files are used to document Quarterly, Annual, Semi-Annual, and PM's required less frequently. History Files can be maintained either

electronically or on paper and should remain at the Branch. (Note: It is strongly recommended that all electronic files are backed up in some way; i.e., on paper, disk, and or etc). Equipment History Files do not have to be forwarded to the Safety Department. Blank templates of Equipment History Files are located in the Mechanical Integrity Program Manual.

Both the Monthly PM paperwork and Equipment History Files must reflect what is physically at the Branch. Initial and periodic editing updates must be completed to reflect the equipment and systems being inspected and maintained at the Branch. Handwritten editing of the inspection forms themselves are not authorized as these files are subject to inspections by outside agencies, however, Monthly Inspection results may be handwritten as long as they are legible and the correct equipment condition codes are used. Preventative Maintenance paperwork should be reviewed monthly and Equipment History Files must be updated based off of corrective action dates.

PM - Long Range Plan (2010) - Branch

Equipment	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Semi	2nd Semi	Annual
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
	January	April	July	October			
					January	July	
					January	July	
					January	July	
					January	July	
					January	July	
							January
							January
							January

MONTHLY

PREVENTATIVE MAINTENANCE

MILFORD

Month Of: _____

Maintenance Person : _____

I certify that I have completed all Monthly Preventative Maintenance Checks in accordance with JCI - Standard Operating Procedures.

_____